REMARKS

Reconsideration of this application, as amended, is respectfully requested.

ALLOWABLE SUBJECT MATTER

The Examiner's indication of the allowability of the subject matter of claim 15 is respectfully acknowledged.

Claim 15 has been amended to be rewritten in independent form to include all of the limitations of claims 1 and 7 from which claim 15 formerly depended. In addition, claim 15 has been amended to add a definition of "m" and to correct the definition of "b," as supported by the disclosure in the specification at page 41, lines 21-23.

No new matter has been added, and no new issues with respect to patentability have been raised.

Accordingly it is respectfully submitted that amended independent claim 15 is now in condition for immediate allowance.

THE TITLE

The title has been amended to more clearly indicate the nature of the invention to which the claims are directed, as required by the Examiner.

THE CLAIMS

Claim 1 has been canceled and claim 19 has been added to more clearly and positively recite the features of the present invention in better U.S. form, as supported by the disclosure in Figs. 1-5, for example, and the disclosure in the specification at, for example, pages 14-17 and 25-28.

Claim 11 has been amended to clarify the feature of the present invention whereby the mark recording section causes the predetermined nozzle to eject ink for a distance necessary for printing the mark by changing data corresponding to the predetermined nozzle to one, as supported by the disclosure in the specification at page 36, lines 3-8.

Claim 12 has been amended to clarify the feature of the present invention whereby the mark recording section prevents nozzles adjacent to the predetermined nozzle from ejecting ink by controlling the nozzles to be zero filling with ink, as supported by the disclosure in the specification at page 36, lines 13-17.

Claim 17 has been amended to more positively recite a light emitting element and a light detecting element. See, for example, Fig. 3 and claims 13-15.

And claims 2-14 and 16-18 have been amended to depend from new independent claim 19, and/or to make some minor grammatical improvements and to correct some minor antecedent basis problems so as to put the claims in better form for issuance in a U.S. patent.

No new matter has been added, and it is respectfully requested that the amendments to the claims be approved and entered.

RE: USP 6,900,449 ("Bolash et al")

Claim 6 was rejected under 35 USC 103 as being obvious in view of the combination of USP 6,158,344 and USP 6,900,449 ("Bolash et al").

Bolash et al has a filing date of January 15, 2003, which is after the October 18, 2002 filing date of JP 2002-304279, which is one of the two priority documents whose priority is claimed by the present application.

Submitted herewith is an accurate English translation of JP 2002-304279, to show that claim 6 is fully supported by this priority document and is therefore entitled to the priority date of October 18, 2002.

It is respectfully requested, therefore, that Bolash et al be removed as a reference against the present application.

THE PRIOR ART REJECTION

Claims 1, 4, 5 and 7 were rejected under 35 USC 102 as being anticipated by USP 6,158,344 ("Walker et al '344"); claim 2 was rejected under 35 USC 103 as being obvious in view of the combination of Walker et al '344 and USP 6,315,382 ("Gudaitis et al"); claim 3 was rejected under 35 USC 103 as being obvious in view of the combination of Walker et al '344 and USP 6,412,909 ("Tayuki et al"); claim 8 was rejected under 35 USC 103 as being obvious in view of the combination of Walker et al '344 and USP 6,386,671 ("Huston et al"); claims 9 and 18 were rejected under 35 USC 103 as being obvious in view of the combination of Walker et al '344 and USP 4,839,674 ("Hanagata et al"); claims 10, 11 and 12 were rejected under 35 USC 103 as being obvious in view of the combination of Walker et al '344, US 6,775,022 ("Noyes et al"), USP 5,539,434 ("Fuse") and US 6,843,547 ("Adkins et al"); claims 13 and 14 were rejected under 35 USC 103 as being obvious in view of the combination of Walker et al '344 and USP 6,425,650 ("Walker et al '650"); and claims 16 and 17 were rejected under 35 USC 103 as being obvious in view of the combination of Walker et al '344 and USP 6,352,331 ("Armijo et al"). These rejections, however, are respectfully traversed with respect to the claims as amended hereinabove.

According to the present invention as recited in new independent claim 19, an inkjet recording apparatus is provided which comprises: a recording head including a plurality of nozzles aligned in a sub-scanning direction; a recording section to record an image on a recording medium by jetting ink droplets from the nozzles while moving the recording head in a main scanning direction; a mark recording section to record a mark on the recording medium using a predetermined nozzle; a mark detecting unit, which is mounted on the recording head at a position separated from the predetermined nozzle along the sub-scanning direction, to detect the mark; a recording medium feeding section to feed the recording medium in the sub-scanning direction; and a control section to control the recording medium feeding section to feed the recording medium for a predetermined distance, such that the recording medium feeding section feeds the recording medium until the mark detecting unit detects the mark and then feeds the recording medium for a distance remaining up to the predetermined distance based on a feeding amount by the recording medium feeding section.

With this structure, the mark recording section prints a mark (for example, a single mark) on the recording medium using a nozzle (for example, a single nozzle). The recording medium feeding section feeds the recording medium until the mark detecting unit detects the mark. The recording medium is then fed more until it has been fed a predetermined distance, based on the feeding amount of the recording medium feeding device.

Thus, according to the present invention as recited in new independent claim 19, the recording medium feeding control based on the feeding amount by the recording medium feeding section, is not carried out until the mark is detected. That is, since the distance between the predetermined nozzle and the mark detecting unit is known, it is possible to feed the recording medium until the mark is detected without performing control based on the feeding amount by the recording medium feeding section. And as recited in new independent claim 19, when the mark is detected, the recording medium feeding section is then controlled to feed the recording medium for a distance remaining up to the predetermined distance based on a feeding amount by the recording medium feeding section. Accordingly, the recording medium can be fed very accurately utilizing the claimed present invention, since it is not necessary to perform control based on the feeding amount by the recording medium feeding section for a long distance of feeding the recording medium.

According to Walker et al '344, by contrast, Fig. 5 (cited by the Examiner) shows a calibration sheet 64 having calibration marks 66 that are formed "by an accurate means other than the printer itself, such as by lithography" (column 5, lines 4-5). Thus, Fig. 5 of Walker et al '344 clearly does not relate to a mark printed by a predetermined nozzle of the printhead of the image forming apparatus, in the manner of the present invention as recited in new independent claim 19.

Alternatively, Fig. 10 of Walker et al '344 shows a calibration sheet 100 printed by the printer itself "with precisely spaced nozzles." The calibration sheet 110 according to Walker et al includes sets of calibration marks 101-105. In addition, Fig. 12 of Walker et al '344 shows a calibration sheet 110 having overlapping pairs of calibration marks 111-119. Each pair of marks 111-119 is printed by a single pass of the printhead, according to Walker et al '344.

According to Walker et al '344, the calibration sheets printed in this manner are transported through the printer to determine error of the feed roller of the paper feeding mechanism.

With the sheet shown in Fig. 5, for example, the "apparent" pitch (detected with an optical sensor) is determined when the calibration sheet is transported with the feed roller and compared to an "actual" pitch to determine slip error of the feed roller. See Fig. 6 of Walker et al '344. With the calibration sheets shown in Fig. 10 and Fig. 12 of Walker et al '344, moreover, differences between "apparent" and "actual" intervals are used to determine positioning errors.

Thus, it is respectfully submitted that Walker et al '344 merely discloses comparing known intervals between marks to detected intervals between marks to identify errors in the feeding system of the printer.

It is respectfully submitted that merely analyzing actual and apparent distances between calibration marks does not at all correspond to the feeding control performed by the present invention as recited in new independent claim 19, whereby the control section controls the recording medium feeding section to feed the recording medium for a predetermined distance, such that the recording medium feeding section feeds the recording medium until the mark detecting unit detects the mark and then feeds the recording medium for a distance remaining up to the predetermined distance based on a feeding amount by the recording medium feeding section.

The Examiner contends that Gudaitis et al disclose the features of the present invention as recited in claim 2, whereby the recording medium is fed at a high speed until the mark is positioned at a position which is adjacent to a position at which the mark will be detected by the mark detecting unit, and then feeds the recording medium at a low speed from the position adjacent to the position at which the mark will be detected. With this structure as recited in claim 2, the speed of the recording medium is changed to a low speed when the mark nears the mark detecting unit.

However, according to Gudaitis et al, the printer initiates a first drive roller advance to the desired location, at a relatively fast speed. Assuming some overshoot or undershoot occurs, the printer initiates a second drive roller advance at a relatively slow speed, to position a selected group of printhead rows accurately over a desired print location on the print medium.

It is respectfully submitted that this feature of Gudaitis et al does not correspond to the features of the present invention as recited in claim 2.

With respect to claim 3, it is respectfully submitted that Tayuki et al merely discloses a memory for storing control parameters, including the position of pixels that are to be formed during each primary scan and the feed of the sub-scan (column 3, lines 9-11, cited by the Examiner).

In addition, it is respectfully submitted that storing control parameters as in Tayuki et al does not at all correspond to a memory to store the feeding amount by the recording medium feeding section, as recited in claim 3. And it is respectfully submitted that Tayuki et al does not even remotely suggest that when the mark detecting unit can not detect the mark, the recording medium is fed based on a previously stored feeding amount in the memory.

It is respectfully submitted, moreover, that Walker et al '344 does not disclose a changeover section as recited in claim 5, and it is respectfully submitted that Walker et al '344 does not disclose, teach or suggest that the recording medium feeding section calculates and assumes a position which gives a smallest detection error from a distance interval calculated by a nozzle pitch of the recording head, referring to a position of each mark detected by the mark detecting unit, as recited in claim 7.

Regarding amended claim 7, moreover, Walker et al ('344) and Tayuki et al do not calculate and do not assume a position which gives the smallest detection error from the distance interval calculated by the nozzle pitch of the recording head.

With respect to claim 9, it is respectfully submitted that the marks 9-12 of Hanagata et al are not upstream of the record area A. Indeed, Fig. 4 of Hanagata et al shows marks 9-12 being beside a record area A in which printing is performed. By contrast, according to claim 9, the mark is printed on an area which is upstream, in the sub-scanning direction, of an area on which the main scanning of the recording head performs the recording.

With respect to claims 13 and 14, it is respectfully submitted that Walker et al '650 does not disclose teach or suggest a light reflection type sensor including a light emitting element and a condenser lens whose optical axes are either both perpendicular to or both slanted with respect to the surface of the recording medium as recited in claims 13 and 14.

And with respect to claim 18, it is respectfully submitted that Hanagata et al does not disclose a single mark that is printed by one scan and is perpendicular to the sub-scanning direction as recited in claim 18.

In view of the foregoing, it is respectfully submitted that the present invention as recited in new independent claim 19, as well as each of claims 2-14 and 16-18 depending therefrom, clearly patentably distinguishes over Walker et al '344, taken singly or in combination with any of the other cited references, under 35 USC 102 as well as under 35 USC 103.

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Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned for prompt action.

Respectfully submitted,

/Douglas Holtz/

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